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ABSTRACT

A study compared the performance of 12 reading disabled and 15 normally achieving third grade students and 11 normally achieving first grade students on a variety of measures at different levels of language and reading in order to examine several macro models of reading disability--specifically, the general language, rule abstraction, and speed of processing models. Each child completed (1) a free story telling task, (2) story recall tasks, (3) a linguistics structure repetition test, (4) rapid naming tasks, (5) an orthographic regularity test, and (6) a reading diagnostic scale. Results showed that reading-disabled third grade students were very similar in language performance to reading-level-matched first grade students. In addition, the findings indicated that of the models tested, the rule abstraction model seemed to account best for the differences between the two third grade groups. (FL)

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Performance of Reading Disabled Children at Different Levels of Language: A Model-Based Exploration

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Running Head: Levels of Language

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Abstract

An exploratory study compared the performance of 12 reading disabled and 15 normally achieving third graders and 11 normally achieving first graders on a variety of measures at different levels of language and reading in order to examine several macro models of reading disability. It was found that (a) reading disabled third graders were very similar in langauge performance to reading level matched first graders, and (b) of the models tested in this study--the general language, rule abstraction, and speed of processing models--the rule abstraction model seemed to best account for the differences between the two third grade groups. Implications for both further research and practice are provided.

That learning disabled children with reading problems perform differently on langauge tasks than normally achieving children is well established. Reading disabled students have been found to have deficits on phonolc ical awareness tasks (Johnson & Hook, 1978; Liberman & Shankweiler, 1979), on tasks involving rapid access of semantic information (Denckla & Rudel, 1976; Mattis, 1981; Spring & Capps, 1974), in their knowledge and use of syntactic structure and morphological rules (Vogel, 1975; Wiig, Lapointe, & Semel, 1975; Weinstein & Rabinovitch, 1974), in their use of pragmatic rules in conversation (Donahue, Pearl, & Bryan, 1982), and in their use of story structure in the comprehension of narratives (Smiley, Oakley, Worthen, Campione, & Brown, 1977; Weaver & Dickinson, 1981). These findings are only a sample of the research in this area; more complete reviews - such as those by Carr (1981), Stanovich (1981a, b), and Vellutino (1979) - cite additional evidence for language performance differences between reading disabled and normally achieving children at nearly all levels of linguistic performance and school ages.

While researchers agree that language performance differences exist they do not share a common theory that explains those differences. An examination of the research reveals that of the several theories that have been proposed to explain these differences the broadest position has been set forth by Vellutino (1979). He suggested that reading disability can be characterized by a lack of awareness of the

nature of language (metalinguistic awareness) and a deficit in linguistic abilities in general. Vellutino has been criticized for his apparent insistence on a single cause for reading disabilities (Fletcher & Satz, 1979), but many others have suggested that at least a sizeable subset of children with reading disabilities have general language deficits (e.g., Mattis, 1981).

Two other models that attempt to specify the underlying mechanisms for both the language deficits of reading disabled children and their reading problems might be termed the speed of processing model, and the rule abstraction model. Researchers who have taken the speed of processing position (e.g., Denckla and Rudel, 1976; Spring, 1976; Perfetti & Lesgold, 1979) suggest that children with reading disability are slower to retrieve information from long term memory, and that this slowness creates a bottle neck in short term memory, forcing both language processing and reading comprehension to suffer. Studies have found that reading disabled students are slower both in rapid naming tasks (Denckla & Rudel, 1976; Spring & Capps, 1974) and in the decoding of both real and nonsense words (Perfetti & Lesgold, 1979; Curtis, 1981).

The rule abstraction model hypothesis extends the verbal deficit hypothesis in a different direction. Johnson & Hook (1978) suggest that reading disabled children have difficulty in abstracting rules from exposure to linguistic stimulation. While normal children

easily induce the rules that govern language at the syntactic, semantic, and discourse levels, reading disabled children do not, possibly because they lack the ability to reflect on their language (metalinguistic awareness) or bacause they have a specific deficit in inductive reasoning processes.

These positions (general language deficit, speed of processing, and rule abstraction) are only three of many that have attempted to explain the difficulties that reading disabled students have in both reading and language. Although these three general positions are very different from each other, in practice it is difficult to distinguish their implications since they make very similar predictions, although for different reasons. Take, for example, the finding that reading disabled students do not appear to be as sensitive to structural variations in their recall of narratives as their normally achieving peers (Smiley et at., 1977; Weaver & Dickinson, 1981). The language deficit position would cite this as further evidence of a pervasive difficulty with language. The speed of processing position would suggest that difficulties with lower level processes, such as speed of encoding and retrieving information from long term memory,would impair the operation of higher level processes in language, such as those involved in the use of structure in recall of stories. The rule abstraction position would suggest that learning disabled students have not completely abstracted the "rule" governing

narrative structure, or have abstracted incorrect rules, thus affecting their performance on a recall task.

Separating these positions is made even harder by the research designs used in the majority of these studies. Very few studies have looked at the performance of reading disabled children across a wide range of different language tasks, or across different linguistic levels. Typically, researchers have compared the performance of reading disabled students to their normally achieving peers on several tasks at a single linguistic level or on a single language performance task. While the cumulative effect of such research might be to suggest general verbal dificits in reading disabled children, one must test language at a variety of levels in order to postulate a general linguistic deficit. Idiosyncratic deficits, occuring in some types of language tasks but not in others, would have important theoretical implications.

Another problem found in this research is the near exclusive use of age-matched controls. There is some evidence that exposure to the more formal language of texts is related to the development of more mature structures in oral language (Chomsky, 1972). If so, the possibility cannot be ruled out that the language deficits of these children, rather than being the cause of their reading disability, may in fact be the result of that disability. Since children with reading disability are normally reading less sophisticated texts in their

classrooms (Allington, 1983) it is possible that lack of exposure to complex linguistic structures in reading may have resulted in less facility with these structures in oral language. While it is impossible to control for this differential exposure to texts, one compromise has been to use a reading level matched control group, or a group of younger children reading at the same level as the reading disabled students (Guthrie & Tyler, 1976; Pflaum, Pascarella, Augustyn, & Auer, 1982; Steinheiser & Guthrie, 1977). Inclusion of a younger control group would also allow the evaluation of developmental hypotheses, or at least provide evidence as to whether children with reading disabilities are qualitatively different than their peers or whether they are merely delayed in certain skills.

The present study looked at the performance of learning disabled and normally achieving children on a variety of tasks at the semantic, syntactic, and discourse levels of language and at the orthographic level in reading. The wide variety of tasks allows one to take a broad look at language and reading performance. This study also uses both an age matched and reading level matched control groups, thus avoiding two of the most common limitations of earlier studies.

Many of the earlier studies in this area are subject to a third limitation, not using a large enough sample size to look for reliable subgroups. Studies that have used relatively large numbers of learning disabled children have found that this population is not homogenous

bu instead composed of several subgroups (Mattis, 1981). The largest subgroup in most of these studies is a group with specific language deficits (Mattis, 1981). The present study uses too small a sample size to look for subgroups, so it is not clear whether the results reflect the performance of the largest subgroups, or reflect some composite of performance among different subgroupings. Because of this limitation, these results should be considered as tentative, subject to replication with a larger sample.

METHOD

Subjects. Thirty eight first and third grade boys attending three schools in Northern West Virginia participated in this study. Twelve of the third graders were classified as learning disabled and were attending resource room programs. Local school system regulations require that children attending resource rooms as learning disabled score above 85 on either the Verbal or Performance scale of the WISC, perform at least two years below grade level in one or more academic areas, and have no other discernable handicapping conditions. These 12 students were all of the third grade resource room students in the four schools that we were able to get permission to test (out of a total of 16 potential subjects). A second group of 15 normally achieving third graders served as an age-matched control group. These students were selected by choosing the normally achieving boy who immediately followed a learning disabled subject on the teacher's rolls. A reading level matched control was obtained by randomly selecting

first grade boys who were judged by their teachers to be of average achievement for their grade. Permission was obtained for 11 first graders to participate.

Materials. The reading and language battery was constructed so that it would (a) sample language skills at a variety of levels, (b) have more than one task at each level, (c) contain tasks as close to those used in previous studies to allow comparisons with the results of those studies, and (d) be administered in one hour or less. This last concern was a pragmatic one; we felt it would be difficult to get participants for multiple testing sessions, especially the control subjects, and that one hour was the maximum feasible time for a single testing session.

The measures used in the study were:

1. Free Story Telling Task. Subjects were asked to "Tell me a story. Make it about anything you want, but make it one that you've made up yourself. Don't tell me one you've heard before, but make one up yourself." Stories were tape recorded and the tapes were transcribed. The stories were analyzed as to both the number of words per t-unit (Hunt, 1978), a measure of syntactic maturity in oral language, and the maturity in their use of plot elements based on the work of Propp (Botvin & Suttonsmith, 1978). Non Fiction accounts and importations were excluded from Propp scale analysis, but used in the words per t-unit analysis.

2. Story Recall Tasks. Two of the stories used by Stein and Glenn (1978) in their development of their story grammar, "The Tiger's Whisker" and "Epaminondas," were read to each subject. Subjects were asked to recall each story immediately. These recalls were tape recorded and coded as to the total number of idea units recalled, either exactly or in paraphrase.

3. Linguistic Structures Repetition Test (Fisher, 1974). This test consists of thirty six sentences of eight words apiece but with varying syntactic structures. Each sentence was read to the subject who was asked to repeat it exactly as he heard it. Two points were given for exact repetition, one point if the target structure was correctly repeated but some other change was made, and no credit if the target structure was incorrectly repeated.

4. Rapid Naming Tasks. Three of the tasks used by Spring & Capps (1974) were adapted for use in this study. Boards containing pictures of common objects, digits, and colors were prepared according to the description in Spring & Capps (1974). Students were timed on how long it took to name the 25 objects, the 30 color squares, and the 25 digits.

5. Orthographic Regularity Test. In order to measure the child's use of orthographic rules, a visual memory task was developed for this study. Fifteen orthographically regular, pronounceable nonwords (e.g. "thrab", "ickle") were put on 3x5 indix cards using ½ inch high letters. Irregular anagrams of these nonwords (e.g.,

"rbhta", "ckiel") were similarly prepared. Each card was exposed for 2 seconds, after which the card was taken away and the subject was asked to report what he saw. The fifteen orthographically regular nonwords were presented first, followed by the irregular nonwords. The number of letters correctly reported for regular and irregular nonwords was recorded, and the difference was used as a measure of the child's use of orthographic rules.

The number of letters reported from regular and irregular nonwords were both used in the analysis, in addition to the orthographic rule score. The number of letters reported from regular nonwords seemed to be related to speed of decoding, since fast decoders might be more likely to see each nonword as a unit and be better at reporting the letters. Indeed, this score had a high correlation to both the Word Recognition(r=.82) and Oral Reading (r=.78) tests (described below).

6. Diagnostic Reading Scales (Spache, 1972). This is an individually administered, standardized battery of reading tests. Two subtests were used for this study, Word Recognition and Oral Reading. For efficiency, the questions following each passage were omitted.

RESULTS

Since this is an exploratory study, it was decided to do a series of univariate one-way analyses of variance to explore the

patterns of performance of the three groups on each measure. Post hoc testing was performed using the Student-Newman-Keuls Multiple Ranges test to determine the sources of these differences. The results of these analyses are shown on Table I.

Insert Table I about here

Repeated univariate analyses, such as those reported here, are not considered to be a valid procedure, since one of the effects of many different analyses, each using a .05 level of significance, is to increase the possibility that a result will appear significant by change alone. Even though none of these analyses yielded a p value of more than .02, which should be adequate to insure the reliability of these results, the specific measures which appear to show significant differences are not as interesting as the patterns of significant comparisons between the learning disabled students and the two control groups. Of the thirteen different measures, ten showed an overall significant difference among the three groups. On all of these ten measures, the third grade normally achieving students significantly outperformed the third grade learning disabled student. However, in only four measures did the first grade students significantly

outperform the third grade learning disabled students. (There were no measures where the learning disabled students performed significantly higher than either normally achieving group.)

The measures in which a significant difference was found between the learning disabled and first grade children (Word Recognition, Object Naming Speed, Sentence Repetition, and Story Telling) do not appear to be related in any obvious way, and possibly reflect an artifact of making multiple comparisons. It is safe to say that, as a whole, the learning disabled children's language performance was more like that of the reading level matched normally achieving first graders than that of their age matched normally achieving peers.

The general trend of strong differences between the two groups of third graders and little difference between the learning disabled third graders and the first graders was also found in the second analysis performed. Each theory (general language deficit, speed of processing, and rule abstraction) previously discussed was translated into a regression model statement and the amount of variance accounted for by each model was calculated separately to allow comparisons between the learning disabled students, the age-matched third grade control, and the reading level matched first grade control. It was assumed that if learning disabled children were deficit in all areas of language, then the linguistic structures repetition test, the three measures of naming, speed, the number of words

per t-unit, the Propp scale and the retelling of Epaminondas and the Tiger's Whisker would account for the largest amount of variance. (This analysis was done twice since four learning disabled and five normally achieving third graders did not receive a Propp scale score, either because they gave a non-fiction story of an importation, or because they did not respond to the story telling task. Since the multiple regression procedure would exclude those subjects, the analysis had to be done without the Propp score and the words per t-unit count, but including all subjects on the other variables). Similarly, if the rule abstraction hypothesis was correct, then the orthographic regularity score, the linguistic structures repetition test, the Propp Scale score and the two retellings would account for the largest amount of variance. (Two separate analyses were also done for this model, for the reasons discussed above). If the speed of processing model was correct, then the three naming tasks and the number of letters reported correctly from regular nonwords would account for the largest amount of variance.

Due to the type of recording tasks used in this study, a fourth model was also included. This model, the Decoding Model, included the oral reading and word recognition subtests of the Spache, the orthographic score, and the number of letters correctly reported from the regular nonwords. Since the groups were chosen at least in part on the basis of reading ability,

one might expect that this model would account for a significant percentage of the variance between groups. However, if the language based models are accounting for the causes of reading disability as opposed to their effects, it might be argued that they should account for a larger percentage of variance between groups than reading alone.

Insert Table 2 about here

As shown on Table 2, when the two groups of third graders were compared, all four models account for a significant amount of variance. The Rule Abstraction Model seems to describe the data better than the other three models. When the Propp Scale score was included (and nine subjects excluded), the measures listed under this hypothesis accounted for 80% of the variance in group membership. This is the only one of the models that exceeded the 72% of the variance accounted for by the Decoding model (and the Propp scale and words per t-unit were excluded), the amount of variance accounted for by the rule abstraction model dropped to 58%, closer to those amounts accounted for by the general language model and the speed of processing model. The power of the four models to discriminate between learning disabled and reading level matched normally achieving first graders was considerably weaker, however, None of the models accounted for a significant

amount of variance in group membership, although the general language model accounted for 30% of the variance and the rule abstraction model accounted for 25%.

A stepwise discriminant analysis indicated that, of the six language measures, the linguistic structures repetition test alone ($r = .272$, p .01) significantly discriminated between the first graders and the learning disabled students. No other variables added a significant amount of variance in group membership. (Of the three other measures in which a significant difference between these two groups was found in the univariate analyses reported above, the word recognition subtest was not included in this analysis since it was not a language measure, the Propp scale was omitted to avoid the loss of subjects, and the discriminatory power of Speed of Naming Objects did not reach significance, $F=3.79$, $p=.065$.)

The numbers of children from each group answering each item on the sentence repetition test correctly (score of 1 or 2) was graphed and examined visually. The overall pattern of responses was similar for all three groups, and there did not appear to be any qualitative differences in the types of sentence structures recalled correctly by the three groups.

DISCUSSION

The two basic findings of this study can be summarized as

follows: 1) while the language performance in general of learning disabled students was significantly poorer than that of age matched normally achieving third graders, the language performance of the learning disabled students and the reading level matched first grade controls was very similar, and 2) of the three models suggested above, the rule abstraction model (including the story telling measures) seems to be best able to account for the differences between normally achieving and learning disabled third graders. However, when the learning disabled students were compared to reading level matched younger students, there were no significant differences between any of the combinations of measures suggested by the three models.

The similarity of the language performance of the learning disabled third graders and normally achieving first graders on the majority of measures is not surprising. Other studies using reading level matched control groups have found similar results. Guthrie and Tyler (1975) found that normally achieving and learning disabled children reading at the fourth grade level did not differ in their recall of orally presented meaningful, anomalous and random strings of words. Steinheiser and Guthrie (1977) found that good and poor readers matched at the second grade reading level did not differ significantly in their response latency to a sentence completion task. Pflaum, et. al. (1982) found that learning disabled and

and normally achieving children matched at a second grade reading level did not differ significantly in their response to instruction.

Of the three models used in this study, the rule abstraction model would appear to have the least compatibility with the general similarity between the two reading level matched groups, even though it appeared to be the most powerful explanation of differences between third grade learning disabled and normally achieving children. In its strongest form, the rule abstraction model would suggest that the language performance of reading disabled children, because it is based on faulty or imcomplete use of rule-governed structures, would be qualitatively different from that of normally achieving children, regardless of the grade. Therefore, the rule abstraction model would predict a greater number of differences between the language performance of the learning disabled children and the first graders.

A look at the two measures in which such differences were found may resolve this apparent contradiction. The Propp scale applied to the free story telling is a qualitative scale, measuring the qualities of children's story telling. As such, it may be more sensitive to subtle variations in language performance. As it turned out, the scale did not need to be very sensitive--the stories told by the learning disabled students were markedly different from those told by the first graders. Of the eight learning disabled students who responded to the story telling task, only

two were able to tell a coherent story. The rest of the "stories" were either fragments, missing either a motivating conflict or a major character (incomplete narratives), or were so disordered in sequence that they could best be termed random narratives. Only two of the first graders were unable to tell a story, and those two were fragments, a form found in the developmental studies of Botvin and Suttonsmith (1977). The other types of stories told by reading disabled children, the "stories" missing either a conflict or major character and the random narratives, were not either told by first or third grade normally achieving children. The "incomplete narratives" seem to be the best example of faulty rule abstraction, since stories should contain both a major character and a motivating conflict to be a "true" story. Omitting one of these essential elements may indicate that the child is not aware of the rules governing what elements a story should contain.

The sentence repetition task, the other measure on which the learning disabled third graders and the first graders were significantly different, is not as pure a measure of use of rule knowledge and use as the Propp scale. The measure was chosen, however, because it does tap the use of fairly advanced syntactic structures, such as nominalization ("The last sometimes miss getting as many turns."), modals ("Her sister asked if she might go too."), and adjective clauses ("The coat the man wore was dark blue."). Generating these

structures would require the knowledge of transformational rules (Akmajian, Deners, & Harnish, 1979); so this task also may measure the child's knowledge of syntactic rules.

The other models tested using this data - the general language and the speed of processing model - also accounted for significant amounts of variance between third grade normally achieving and learning disabled children. Therefore, neither model can be discarded on the basis of this study. These models may account for the relationship between language deficits and learning disabilities in at least a subgroup of learning disabled children.

For researchers, the results of this study suggest a way of doing theory based research into the correlates of reading disability. The model-based exploration of the relationships of language performance and reading disability may be a practical method of weighing the implications of various theoretical models of reading disability. Practically from the beginning of the field, theorists in reading and learning disabilities have proposed macro theories of factors underlying reading disability. Macro level studies have been relatively rare, and those which have been performed are usually compilations of clinical records. While such compilations are valuable, controlled experimental comparisons are also necessary. This study presents one possible technique for doing such comparisons.

For educators, the rule abstraction model, which seems to best

account for the performance of the reading disabled children in this study, is a useful one. Such a model would suggest that if learning disabled children are deficient in the ability to abstract or induce rules, the instruction should be explicit, limiting the requirement that the child figure out rules by him or herself. Such "low inference" instruction has been used successfully to teach decoding and word identification skills in direct instruction programs such as those of DiSTAR (Englemann & Bruner, 1968), Orton-Gillingham (Gillingham & Stillman, 1960); - to name a few. These direct instruction, low inference techniques have begun to be extended to reading comprehension instruction (Duffy, Roehler & Mason, 1984; Paris, Lipson, Oka, Jacobs, DeBritto & Cross, 1982; Deschler, Alley, Warner & Schumaker, 1981), and have been found to be especially effective in improving the comprehension of poor readers. The rule abstraction hypothesis suggests why these techniques may work with disabled readers, and suggest further examination of instruction to minimize the need for these children to induce rules.

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